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ABSTRACT

This descriptive research study examined the validity of an adaptation of the Learning and Study Strategies Inventory (LASSI) that uses a videotape with questions in American Sign Language with a special group of hearing-impaired college students, assuming that LASSI is still reliable for this group. The study was limited to prelingually deaf students (n=23) with moderate, severe, or profound hearing loss. Average LASSI scores and certain subscales showed predictive value due to significant correlation with grade point averages (GPA) of students. When hearing-impaired students with documented moderate and severe learning problems were compared with hearing-impaired students without additional learning problems, the students with learning problems showed significant differences in the direction of lower GPA, while they showed no significant effects on LASSI scores. (Author/PB)

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PILOT INVESTIGATION OF RELIABILITY AND VALIDATION OF THE MODIFIED LEARNING AND STUDY STRATEGIES INVENTORY (LASSI) FOR HEARING-IMPAIRED PREPARATORY STUDENTS AT GALLAUDET UNIVERSITY

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Abstract

There are very few studies involving hearing-impaired students in the literature on learning strategies and study skills. One possible explanation is the lack of a suitable inventory for measuring their study behaviors and cognitive patterns. Several self-report inventories developed for the hearing population are useful in predicting college achievement and in diagnosing learning and study strategy deficiencies for intervention.

Unfortunately, these inventories are unsuitable for deaf students whose reading levels are significantly lower than those of their hearing peers. The Learning and Study Strategies Inventory (LASSI) has been established as a reliable and valid instrument for the hearing population. A LASSI adaptation using a videotape with questions in American Sign Language (ASL) was developed for use with hearing-impaired college preparatory students within the School of Preparatory Studies (SPS) at Gallaudet University. The LASSI was included in the syllabus for the required study skills development program which is a part of the SPS curriculum.

The purpose of this descriptive research was to determine the validity of this adapted instrument with this special group of hearing-impaired college students, assuming that LASSI is still reliable for this group. The study is limited to prelingually deaf students with moderate, severe, or profound hearing loss.

The total LASSI scores were correlated with Grade Point Averages (Fall GPA, $r=.35$, $p<.01$, and Spring GPA, $r=.33$, $p<.01$) and tested to see if individual LASSI scores will predict achievement on GPA for a new group of students. Average LASSI scores and certain subscales of LASSI--attitude, time management, and self-testing--showed predictive value due to significant correlation with grade point averages (GPA) of students.

Some LASSI subscale scores showed correlation with other performance measures: Degree of Reading Power, reading comprehension subtest of the Hearing Impaired version of Stanford

Achievement Test, and the Gallaudet University's English Placement Test in Reading. The former two measures have been well documented in the literature, while the latter measure has been used solely for placement purposes.

Throughout this study of LASSI scores, hearing-impaired students with documented moderate and severe learning problems were compared with hearing-impaired students without additional learning problems. The students with learning problems showed significant differences in the direction of lower GPA, while they showed no significant effects on LASSI scores.

This study was to determine the effect of the ASL videotape on the LASSI scores. The experimental group who watched the ASL videotape next to a computer monitor displaying LASSI items did significantly better in average LASSI scores than the control group without the ASL videotape (57.31 percentile vs 50.27 percentile, $t=2.83$, $p<.005$). Therefore, the videotape did seem to enhance comprehension for regular students without learning problems in this study. However, the control group of students with learning problems showed better LASSI scores than the experimental group with the ASL adaption of LASSI. This finding needs to be investigated further to see if distraction between the videotape and computer monitor is a large factor for students with learning problems.

Theory of Active Learners with Learning Strategies

In the 1960's, research in educational psychology shifted from teacher to learner as the center of learning processes. The learner was no longer considered the passive agent of environmental manipulation by the teacher through external reinforcement. Instead, the learner was viewed as the active processor of information. Wittrock (1974) called it the "Active Learner Theory." Both groups of developmental psychologists with the metacognitive view and the cognitive psychologists with the executive control view agreed that cognitive processing lies at the center of each active organism (Garner, 1988).

Research also has shifted from a representational level to an executive level of Cognitive Psychology. Instead of focusing

on processes of representing external information as mental codes, there is a more intense focus in the research literature on strategies as conscious sequences of mental operations that manipulate and apply representational knowledge. Wolk (1985) criticized research reflected in the 1984 symposium on Cognition, Education, and Deafness for focusing too much on representational processes. Wittrock (1974) suggested the following reasons for shifting research focus from encoding mechanisms to information-processing strategies:

> Through the study of cognitive and affective processes, we may better understand how to relate information to a learner's background and aptitudes, how to organize and sequence the information and how to stimulate its meaningful processing, comprehension, and long-term memory (p. 94).

Thus the learner becomes the center of learning activities, having both inner cognitive framework and information-processing strategies. The learner uses the strategies in active construction to relate external information to prior experiences.

In this model of active learners, learners must be motivated to have active roles and responsibilities for seeking and acquiring new knowledge and skills. To organize and elicit meaning from text passages, they need to know how to use information-processing strategies and memory storage/retrieval processing strategies along with attentional and motivational mechanisms (Wittrock, 1978; Zimmerman and Pons, 1986; Weinstein, Underwood, Wicher, and Cubberly, 1979; Weinstein, 1987a). The power of the learning strategies lies in enabling a motivated learner to become active (Miles, 1988).

There are three components of Wittrock's Active Learner Theory (1988): Attention, motivation, and reading comprehension. A fourth component, study processes, should be added because a learner needs to be able to retain and retrieve newly acquired information from long-term memory storage.

The strategies used in all of the four components of the Active Learner Theory are termed "learning strategies." A good definition for learning strategies comes from Mayer (1988): "Behaviors of a learner that are intended to influence how the learner perceives information" (p.11). A conscious sequence of thoughts should be added to behaviors of a learner in order to enhance Mayer's definition. Strategies are conscious and sequential; when strategies become unconscious through automatization, they become skills (Garner, 1988).

Learning strategies enhance reading comprehension in text prose, as distinguished from document search (Guthrie, 1988). This paper is focused on text prose, because most undergraduate work consists of reading and comprehending text in narrative style with headings and subheadings, as opposed to searching for information through skimming and analyzing charts, graphs, and other visual information in documents.

In reading, poor readers especially seem to benefit from developing learning strategies. Spring (1985) reported that poor readers used an outlining strategy significantly more than good readers. Pressley, Johnson, Symons, McGoldrick, and Kurita (in press) found that specific strategy training helped poor readers make more significant gains than good readers.

If it is true that poor readers depend more on learning strategies than good readers, then learning strategies become more important for deaf students who have poor reading skills. Deaf students have difficulties especially in acquiring new information from reading. The average reading grade score of 19-year-old hearing-impaired students in postsecondary programs is 4th grade/4th month, similar to the average reading level of 10-year-old hearing students (Trybus and Karchmer, 1977). Hearing fourth graders are just beginning to acquire information from reading and to integrate new knowledge with prior knowledge (Chall, 1983; Gray, 1925, in Harris and Sipay, 1986), deaf students are just beginning to learn these skills at the postsecondary level. In order for deaf students to succeed in college, they must learn to use effective learning strategies while their reading comprehension skills continue to improve through direct instruction and intervention.

Several studies have indicate slow progress in reading development among deaf students in pre-college levels. Meadow (1980) reviewed studies on cognitive development of deaf children which indicated that after third grade, deaf children show extremely slow progress in reading. For example, the Office of Demographic Studies found in retesting 1,543 children who were tested in 1971, that the average increment of reading was .03 grade equivalents per year (Trybus and Karchmer, 1977). It is widely assumed that inferior reading development in deaf children of hearing parents is attributed to inefficient language input in early years. The inefficiency of input is most likely to be

caused by lack of verbal stimulation in the visual mode prior to reading development.

Deaf students enrolling in Gallaudet University as preparatory students need intensive intervention in order to increase their reading levels to the minimum standards for full freshman status--an eighth grade equivalent in reading. A recent report from the Gallaudet University admissions office found that the freshman class has an average of 10.4 grade level in reading. A preparatory student has an average of 5.7 grade level equivalent reading level, indicating a need for three or four years of improvement to attain freshman status. After achieving freshman status, these students still need 2 more years of improvement to be compared with the average Gallaudet freshman student in reading (Goodstein, 1988).

In spite of the subnormal reading achievement of deaf students, their nonverbal performance on the Wechsler Intelligence Scale for Children test is in the same range as for the hearing population. If deaf students have normal cognitive capacities, then what kind of intervention will ameliorate their developmental lag in reading? One of the answers may be learning strategies training. Several studies of Instrumental Enrichment (a learning strategy program) demonstrated that deaf high school and college students improve reading comprehension after learning several cognitive strategies (Martin, 1985a and 1985b; Rohr-Redding, 1985; Jonas and Martin, 1985).

In order to understand how a learner actively processes information with cognitive strategies, there was a need to

develop an assessment of individual strategies. Dansereau's team (Dansereau, Collins, McDonald, Holley, Garland, Diekoff, and Evans, 1979a) developed a learning strategy inventory based on the Active Learner Theory.

The major problem with the self-reported inventories on study habits and strategies of the 1970's was the low correlation of the scores to the academic achievement as measured by Grade Point Averages (GPA). Rowher in 1984 (in Garner, 1988) noticed that the inventories were based on erroneous assumptions that the strategies or habits assumed to be appropriate for all high school and/or college students were the same for all study activities and situations. An effective instrument needed to include a variety of tasks and situations for applying different strategies.

Lacking in Dansereau's (1979a) and other similar analytical instruments was a measure of a metacognitive component that integrated the learning strategies. How do students know which strategies to use for specific tasks?

Also lacking was the component of motivation. How will students be intrinsically motivated to select appropriate strategies for certain learning situations? There was the need to distinguish between competence and performance--students may have developed competence in strategies but may not use them in performance tasks if not adequately motivated. Moores (1985) cautioned, "When we look at deaf children, it is possible that much of what we find governing academic failure is more related to what the children do not do, not to what they cannot do"

(p. 226). In training, they will need to learn metacognitive and motivational strategies in addition to learning strategies.

Addition of Metacognitive Component to the Active Learner Theory

Metacognition is a recent addition to the Active Learner Model. Metacognition is defined as the self-regulated control over learning strategies, consisting of both cognitive and affective strategies (Zimmerman and Pons, 1986). Another good definition of metacognition comes from Jacobs and Paris (1987), "...any knowledge about cognitive states or processes that can be shared between individuals" (p.258).

Metacognitive processes are necessary to select and execute a program of the strategies needed for each task. There is no one single study strategy, because of the wide range of variables in texts, course requirements, and task assignments. Each learner has his or her own knowledge and repertoire of processing strategies to interact with various types of texts (Anderson & Armbruster, 1985; Anderson, 1979).

In the 1980's, the definition of learning strategies was broadened to include metacognitive processes (Jacobs and Paris, 1987; McKeachie, Pintrich, and Yi-Guang, 1985; Weinstein and Mayer, 1985; Zimmerman and Pons, 1986; Weinstein, 1987a).

Addition of Motivational Component of the Active Learner Theory

Recently there has been an increase in research literature on academic motivation from theories of attribution, achievement motivation, self-efficacy, and self-perceptions of competence and

effort. Students need to have intrinsic motivation to learn. Motivation consists of metacognitive, cognitive, and affective processes that influence a learner's tendency to put effort into academic tasks (McCombs, 1988).

In order for students to attribute academic problems to themselves and to resolve these problems, they need to know more about themselves and their weaknesses and strengths. This need for self-awareness has been an important reason for developing an inventory for individual diagnosis of individual learning strategies. Once they accept their limitations and become more self-confident with their strengths, they will focus more of their academic effort into their weak areas and improve.

Weinstein (1987b) developed the Learning and Study Strategies Inventory (LASSI) to include the metacognitive and affective (motivational) component, as well as the cognitive component of learning strategies in the context of varied situations.

Learning Strategies Training for Underprepared College Students

The LASSI was developed in response to the proliferation of Learning Centers and Developmental Education programs to help underprepared and disadvantaged students to cope with college courses. Administrators have supported these programs in an attempt to recruit and retain less qualified students in the light of declining college enrollments (McKeachie, 1988).

These college students are often deficient in basic abilities of English and/or Mathematics. These students include

minorities, athletes, highly anxious students, and students with learning problems and other disabilities. They need to learn cognitive and affective strategies as well as basic reading and mathematical skills to succeed in their academic courses.

Learning strategies training programs were provided to students who were experiencing, or who were predicted to experience, serious academic problems in college. McKeachie (1985) showed significant gains on pre- and post-LASSI scores for 4 types of high-risk college students in a Learning-to-Learn course: 1) freshmen with lower Stanford Achievement Test scores than for the typical university student, 2) minorities, 3) athletes, and 4) highly anxious students. There was a positive correlation (.38, $p<.001$) between post-test score and later grade point averages (GPA). These students also showed significant improvement in internal locus of control, in expectancy for success, and in reducing test anxiety.

Pre- and post-test results in strategy inventories and in reading comprehension measures showed that learning strategies training programs are effective for underprepared and disadvantaged college students. Dansereau (1985), McKeachie et al. (1985), and Weinstein (1982) reported significant gains in reading comprehension, academic performance, and stress reduction for less skilled and highly anxious students in adjunct learning strategies training programs, compared to control groups of general psychology students.

Training in metacognitive, cognitive, and social affective strategies for high school students in

English-as-a-Second-Language (ESL) programs elicited significant gains beyond the $p<.01$ level on tests of vocabulary, listening, and speaking skills, compared to a group trained only in cognitive and social affective strategies. These two groups in turn outperformed the control group who used regular approaches to learning English (O'Malley, Russo, Chamot, Stewner-Manzanares, 1988).

Deaf students at Gallaudet's School of Preparatory Studies (SPS) in the past have shown similar characteristics to hearing students in the learning strategies training programs previously mentioned. The deaf preparatory students scored significantly lower on all of the Stanford Achievement subtests than freshmen at Gallaudet University. Preparatory students' overall Stanford Achievement Test scores ranged from the 72nd percentile (hearing-impaired norm) to the 90th percentile, while freshman students' scores ranged from the 93rd percentile to the 98th percentile (Goodstein, 1988).

SPS has several types of students--minorities, athletes, students with learning disabilities, highly anxious students, and poor test-takers, similar to the students in the previously mentioned learning strategies training programs. In addition, 73% of Gallaudet preparatory students come from residential high schools for the deaf with a high percentage of multihandicapped students and 25% of the preparatory students came from mainstream programs (Goodstein, 1988). Many English teachers at SPS considered some deaf students to be eligible for ESL type of

instruction because English was not considered as their native language.

Since most of the preparatory students as a group are also very weak in reading--with the average reading level being 4.7 years below the freshman class at Gallaudet--the preparatory students are prime candidates for assessment and training in learning strategies. For this reason, LASSI was investigated as a tool for assessment of learning strategies.

Description and Rationale for Using LASSI

The Learning and Study Strategies Inventory (LASSI) has 5 affective scales and 5 cognitive scales (Weinstein, 1987b). The affective scales are:

1) Attitude, to measure general goals and values of college education (ATT).

2) Motivation, to measure academic achievement orientation to specific tasks (MOT).

3) Time Management, to measure effective use of time and organization for accomplishment of academic tasks (TMT).

4) Anxiety, to measure negative emotion and cognitive worry that takes time and energy away from tasks and information processing (ANX).

5) Concentration, to measure ability to pay close attention to academic work without being distracted easily (CON).

The cognitive scales are:

1) Information Processing, to measure elaborating, comprehension monitoring, and reasoning strategies (INP).

2) Selecting Main Ideas, to measure the ability to pick out important ideas from irrelevant information for studying in short time (SMI).

3) Study Aids, to measure the use of supportive methods (text cues) or materials to help studying, including students' own aids (STA).

4) Self-Testing, to measure the reviewing and self-testing strategies in integrating bits of knowledge (SFT).

5) Test Strategies, to measure the ability to plan, prepare, and take certain types of tests (TST).

The development of the LASSI scales over nine years was based on an extensive literature review of cognition, metacognition, motivation, learning, and study strategies. The LASSI has gone through several pilot tests and revisions prior to the large field test for reliability and validity (Weinstein, Zimmerman, and Palmer, 1988).

There are two definite advantages of this inventory over other study skills inventories. They are: 1) Each of the 10 scales is reliable and valid, whereas only a total score of the scales of other inventories is reliable and valid; reliability and validity of each subscale permits individual diagnosis to determine intervention plans for high-risk students. 2) The inventory includes items to measure metacognition and motivation components as well as cognitive strategies. The inventory can also be used as a program evaluation tool for student support services staff in advising, counseling, or training students.

A computer version of the LASSI makes it easier to administer with videotape. Students can type in their responses after watching each item presented in American Sign Language on videotape. If the adapted instrument with the ASL videotape can overcome the reading difficulties of the questionnaire items for the hearing-impaired preparatory students, and if it can predict achievement in individual GPAs, then the LASSI can contribute to

early prediction of low GPA's and to decisions on individual intervention plans.

Investigation on the Adapted LASSI

Purpose. This study was designed to determine if the adapted LASSI in conjunction with the ASL videotape is a useful and valid measure of learning strategies among deaf students at the School of Preparatory Studies at Gallaudet University.

An integrated approach using descriptive research correlating LASSI scores with GPA and other performance measures, along with experimental manipulation of the use of the ASL videotape, offered evidence of the validity of the LASSI for prelingually deaf preparatory students. Since learning problems in some students may confound statistical results, two groups of hearing-impaired students--with and without documented learning problems--are compared throughout the study.

This investigation attempted to establish relationships between the adapted LASSI scores, which are self-reported students' perceptions, and:

1) Reading comprehension measures for all preparatory students involved in this study;

2) Grade Point Averages as a prediction of global achievement;

3) Degree of understanding and communication preference on the LASSI;

4) Groups of poor, average, and good readers based on the DRP, which is one of the standardized tests for reading comprehension.

Students. In 1988-89, 260 Gallaudet preparatory students were enrolled. Generally, they are graduates of high school programs throughout the U.S. and other countries, who do not qualify for admission to the freshman class at Gallaudet University.

The University requires Preparatory students who wish to enter the freshman class to: Achieve an 8th grade equivalent level in reading and writing, complete the Algebra I requirement, and earn a grade point average (G.P.A.) of 2.0 or better. A student's GPA at the School of Preparatory Studies was found to be more predictive of continuing college success than reading or writing placement test scores (Per-Lee, 1986).

Based on the belief that the preparatory students generally lack the study skills to earn a GPA of 2.0 or better, all have been required to take a Preparatory Academic Survival Skills (PASS) course for one credit. As part of the PASS program they must take the LASSI. It is hoped that the LASSI will enhance the students' self-awareness of learning strategies and study habits.

Procedures

1) Elimination of students with post-lingual onset of deafness and mild hearing losses. The Audiology Department at SPS had information regarding which students had prelingual or postlingual hearing loss, and on the degree of hearing acuity for the selection of subjects in this study. Students with a postlingual onset of hearing losses often have good language and reading skills, so their participation in this study was not

included. Also, students with good hearing acuity (the department provided the acuity test of determining which spoken English words students could discern from hearing alone) should be eliminated from the database, because good acuity is not associated with reading development as much as for students with prelingual moderate, severe, or profound hearing losses. Thirty students were eliminated due to the above reasons or due to inconclusive data.

2) Classification of students with and without learning problems in addition to their hearing impairments. The Student Support Services unit at SPS has been gathering psychological documentation on additional learning problems for 70 deaf students. The School Psychologist identified 23 students with moderate and severe learning problems that seriously interfere with college learning. The learning problems are defined as deficiencies caused by 4 major factors: learning disabilities (most prevalent), educational deprivation, serious cultural differences, or lack of intellectual capacity for college; the School Psychologist found 1 or 2 students with severe cognitive functioning abilities that are inappropriate for college-level work. Students with learning problems were distinguished from the rest of the preparatory students throughout this study to prevent any confounding of statistical results. Eighteen out of the 23 students with serious learning problems were included in this study as a separate group from regular deaf students.

3) LASSI Administration. An English teacher whose native language is ASL, and the School Psychologist developed a

videotape using American Sign Language (ASL) translations of the LASSI directions and questionnaire items. The videotape was run through TV/VCR equipment next to IBM PC computers running the Electronic LASSI (E-LASSI) software program. On the videotape, each student watched the ASL translation of each item. During the pauses between items, the student picked one of the 5 responses to the questions on the computer. The responses were: 1. very typical of me, 2. fairly typical of me, 3. somewhat typical of me, 4. not very typical of me, 5. not at all typical of me.

In the fall semester of 1988, most of the preparatory students took the LASSI with the ASL videotape. On some days, when the ASL videotape was not provided, some students had to read the inventory items in English on the computer monitor itself. This process provided a comparison between the ASL-with-English and the English-only versions of the LASSI. The new group of 10 preparatory students who started SPS in January took the LASSI.

3) Performance measures. GPAs were compiled and calculated four times--during the middle and end of each of the two semesters. The GPA for each student was correlated with the student's average LASSI score and with each of the subscale scores on the LASSI scales, along with reading comprehension test results.

Several reading comprehension measures were correlated with the LASSI scores. The reading comprehension part of the English Placement Test (EPT) and the Degrees of Reading Power (DRP) tests

were used. The EPT was developed by the English Department of Gallaudet University. All preparatory students take the EPT and DRP in the first week of arrival on campus in August, and at the end of each semester in December and May.

The reading comprehension subtest of the Stanford Achievement Test with the Hearing-Impaired version was collected by the admissions office prior to acceptance at Gallaudet University; it is widely used with the hearing-impaired population. High correlations of the SAT-HI reading comprehension subtest with the several different types of reading comprehension tasks provided evidence of adequate and consistent prediction of the SAT-HI reading comprehension subtest for deaf students' reading performance (LaSasso & Davey, 1983).

4) Item analysis and content validity of ASL and English versions of LASSI. An English teacher with expertise in both ASL and English examined the LASSI items and the ASL translations to see if each item in both languages had the same meaning. The teacher also evaluated whether the items showed any bias against deaf students.

5) Comparison of poor, average, and good reader groups with other measures. The reading comprehension scores from the DRP taken in August were used to distinguish good readers from poor readers. DRP scores falling below -1.5 standard deviation made up the poor reader group, while the DRP scores falling above +1.5 standard deviation made up the good reader group. The average group consisted of students whose scores fell between -1 and +1 standard deviation of DRP scores. The other two groups' scores

fell between the poor and average groups. The 5 reading levels of these groups were compared with the LASSI scores, GPA, and other reading comprehension measures. They were used to predict GPAs along with certain LASSI scores.

6) Degree of comprehension of ASL and English version of LASSI compared with communication preferences and reading levels. Students were asked to fill out the questionnaire after taking the LASSI. The questions asked the students to rate how much they understood the English items on the computer monitor and the ASL videotape translations. One of the questions asked the students whether they preferred using the ASL videotape with the LASSI or using the English items on the computer only. The other question asked students to indicate their preferred communication modes: Signed or spoken English, American Sign Language, or a mixture of both. The students' reported level of understanding of the ASL or English versions of the LASSI determined their communication preference.

7) Use of LASSI as predictor of GPA to be compared with actual GPA in May, for 10 new students. In January of 1989, 10 new students took the LASSI, along with SAT-HI test upon admission. Their GPA was compiled in May and compared with the predicted GPA based on the LASSI and May DRP scores.

Results and Discussion

Two hundred and sixteen out of 260 preparatory students in the PASS (Preparatory Academic Survival Skills) program took the LASSI, some with the ASL videotape and some without. Thirty were

eliminated due to screening out by the SPS Audiological department, leaving 186 actual cases. The LASSI raw subscale scores, GPA, and other reading comprehension scores were analyzed using SPSS T-test, ANOVA, Multiple Regression, and Pearson-product moment correlation coefficient procedures. The percentile equivalent scores of the LASSI raw subscale scores were noted for comparison purposes. also compiled were the results from the questionnaire responses for communication preferences from 58 respondents. The English teacher with expertise in both English and american Sign Language saw no cultural bias in both the English and ASL versions of the LASSI items.

The average LASSI score for 78 students in the experimental group who took the inventory with the ASL videotape was at the 57.31st percentile as compared with the norm of 50th percentile for hearing students in a large southern university. The average scores of the 81 students in the control group who took the inventory without the videotape was at the 50.27th percentile. The former showed a higher score, with a significant difference from the latter group ($t=2.83$, $p<.005$), indicating that the videotape seemed to help students understand more than those students who were not exposed to the ASL videotape (Appendix A).

Four subscales showed significant differences between the experimental and control groups on using the ASL videotape with the LASSI: Attitude ($t=2.91$, $p<.005$), Motivation ($t=3.25$, $p<.001$), Selecting Main Ideas ($t=2.22$, $p<.05$), and Self-testing ($t=2.52$, $p<.01$). The ASL videotape seemed to help experimental

students' comprehension, attitude, motivation, selecting-main-ideas and self-testing items more clearly than the control group.

Two subscales showed strong similarities between the experimental and control group: Anxiety (t=-.01, p=.996) and Test-taking (t=.36, p=.718). These two subscale results probably showed confusion and misunderstanding of anxiety and test-taking items among all students regardless of whether or not they used the ASL videotape. Other subscales that showed insignificant differences between the experimental and control groups were: Time Management, Concentration, Information Processing, and Study Aids.

The difference in LASSI scores between the experimental and control groups might be increased for students who prefer to communicate in American Sign Language as they would understand the ASL videotape more than the English version on computer monitor. According to the limited communication preference questionnaire responses, 23% of 58 respondents preferred ASL.

This difference between the groups might be smaller because of the larger majority of students who preferred to communicate in English, or in a mixture of both English and ASL--77%. Within this group, the LASSI scores were predicted to be more highly correlated with the reading comprehension measures than with the ASL-preferred group. These predicted results should confirm the need of deaf students for a modification in the reading levels of any inventory items and directions for deaf students to avoid measuring reading skills. One of the possible modifications could include videotape captioning in the lower reading level of

English for students who prefer to communicate through English or through a mixture of both English and American Sign Language.

However, the respondents within the experimental group could not be compared with the respondents in the control group for two reasons. First, there was a higher percentage of AS:-preferred students in the control group than for the experimental group (35% vs 14%). Second was the procedure of distributing and collecting questionnaire responses; the questionnaires were distributed two different times with different procedures at both times. Some students took it within one week after taking LASSI, and others filled out the questionnaire several months after taking LASSI. Therefore, the questionnaire results could not be used in this study, but they should be rigorously pursued in future research on learning and study strategies. However, one interesting result should be noted here--70% of the experimental group preferred both videotape and monitor while 20% preferred only the videotape, and 10% preferred the monitor only.

Students' affective and cognitive scores on the adapted LASSI were almost the same--56.61th percentile and 58.01st percentile, respectively. The lowest scale was the test-taking strategies, 31.82nd percentile, compared with the highest scale, 78.78th percentile, in self-testing strategies. Students seemed to know how to review for tests, but did not know how to take certain types of tests. Two low affective scales were attitude and anxiety--43.26th percentile and 45.01st percentile, respectively. The LASSI scores were also low on selecting main ideas--49.11st percentile (See Appendix A).

Correlation of the average LASSI subscales both with and without the videotape with the Fall semester GPA were positively and significantly correlated at the .01 probability level (.26 and .36 respectively). Four subscales were significantly correlated with the GPA for both groups: motivation (.19 and .35), time management (.26 and .30), study aids (.19 and .21), and selfreviewing techniques (.28 and .31). One subscale had almost no correlation with GPA: test-taking strategies (.01 and .07) (See Appendix B).

The lower correlation of the adapted LASSI scores (using the ASL videotape) with GPA could be attributed to better understanding of items, independent of reading levels which are correlated with GPAs. These results suggested that the students were not as dependent upon their reading skills when coupled with the ASL videotape, as opposed to the students who were not shown the videotape. The students who did not view the ASL videotape, in turn, relied more heavily on their current reading skills. This area needs to be investigated further in research with deaf students.

Some of the LASSI scores of students with no serious learning problems showed some correlation with the performance measures: Motivation scores correlated with the Degrees of Reading Power test taken in August and December and with the English Placement Test taken in August and December. Information Processing and Self-testing scores correlated with DRP test scores in August and December. Selecting-Main-Ideas correlated with the DRP scores in August, December, and May, and also with

the English Placement Test scores in August. Only one LASSI subscale, test-taking, showed some correlation with the Stanford Achievement test. The analysis of LASSI subscale scores with the reading comprehension measures should be continued in order to discern why only certain subscales show correlation with GPAs and why different subscales showed correlation with different reading comprehension measures.

Through multiple regression statistical procedures, average LASSI scale score, attitude, time management, and self-testing subscale scores with August DRP scores did predict individual Fall GPAs (Multiple R=.47 and variance=.22). Likewise, May DRP scores and the above LASSI scores did have predictive value for May GPAs (Multiple R=.33 and variance=.11). The new group of students in January had higher predictive value, closer to significance (Multiple R=.91, variance=.82, F=4.50/p=.087). Certain parts of the LASSI did show some validity through the ability to predict some of the grade point averages.

Students with serious learning problems showed interesting results. The data might not show reliability due to the small sample size of students with learning problems (n=18). However, it would be worth reporting the results here. Students with learning problems in the control group showed an opposite effect--they did better than the experimental group that used both computer monitor and videotape equipment, especially in all of the LASSI cognitive subscales and time management subscales. The experimental group of students with learning problems did

better than the control group only in two areas: concentration and motivation.

This finding is worth investigating further; it could be a result of two possibilities: 1) either the students were less distracted with only one piece of equipment--computer monitor, or 2) students pushed the responses that meant the opposite of what they wanted to express. The computer keys for A through E are rather close together, so it might be easy to make too many mistakes that would confound results.

another finding was related to interaction effect of learning problems on GPAs and on videotape manipulation of LASSI. Learning problems had a significant effect on GPA, but not on videotape. This interaction effect could be related to the above finding of the control group of students with learning problems doing better than the experimental group of students with learning problems.

Conclusion

The results suggested that the adapted Learning and Study Strategies Inventory with an ASL videotape predicted achievement in GPA and in the Degrees of Reading Power test scores for the preparatory students of Gallaudet University. Several LASSI subscales showed some correlations with both GPAs and reading comprehension measures. The results also provide evidence for validity of the adapted LASSI as an instrument for measuring the learning strategies repertoire of preparatory students at Gallaudet University.

The LASSI scores provided an interesting conceptualization of the students as a group. The preparatory students seemed to have problems with test-taking strategies, selecting important ideas, feelings of anxiety, and attitude. Time management, attitude, and self-testing skills have an impact on grades. The PASS program and the preparatory curriculum needed to focus on training the students to develop strategies in these areas.

The adapted LASSI scores did seem capable of predicting poor readers or poor students who are likely to get low grades. These students in the high-risk category will need special interventions such as reading tutorial services with learning-strategies training. Further investigation is needed for students with serious learning problems to discern how their learning problems would affect the LASSI scores, reading comprehension measures, and grades.

Therefore, further validation of the LASSI is suggested for hearing-impaired freshmen at the college and university levels. Research can then proceed and face new challenges in the development of learning and study strategies for students with hearing impairments.

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Appendix A: Table of LASSI raw scores (with percentile ranks in parenthesis) for regular SPS deaf students:

T-tests of LASSI scores between Experimental and Control Groups

Variable	$\bar{X}$ Mean in (Percentile)	S.D.	t value	p value
Affective				
Group A: (Experimental with ASL videotape, n=78): (56.61)				
Group B: (Control without the videotape, n=81): (48.56)				
ATT- Group A:	30.36 (43.26)	3.92		
Group B:	28.41 (29.93)	4.49	2.91	.004*
MOT- Group A:	32.28 (59.66)	4.45		
Group B:	29.88 (45.78)	4.85	3.25	.001*
TMT- Group A:	27.59 (70.27)	5.11		
Group B:	26.38 (64.30)	4.75	1.54	.124
ANX- Group A:	24.54 (45.01)	5.90		
Group B:	24.57 (42.90)	5.50	-.01	.996
CON- Group A:	27.81 (64.84)	5.01		
Group B:	26.89 (59.90)	5.33	1.12	.265
Cognitive				
Group A: (58.01)				
Group B: (51.98)				
INP- Group A:	29.39 (65.96)	4.29		
Group B:	28.01 (62.48)	6.43	1.58	.117
SMI- Group A:	17.47 (49.11)	2.98		
Group B:	16.38 (36.29)	3.21	2.22	.028*
STA- Group A:	27.19 (64.40)	5.23		
Group B:	25.80 (58.60)	5.88	1.57	.118
SFT- Group A:	30.94 (78.78)	4.93		
Group B:	28.75 (70.43)	5.93	2.52	.010*
TST- Group A:	26.22 (31.82)	4.36		
Group B:	25.93 (32.10)	5.71	.36	.712

* Significant differences below the $p<.05$ level.

Appendix B: Table of LASSI averages and Grade Point Averages

Group A--Experimental group using LASSI with videotape (n=78)
Group B--Control group using LASSI without videotape (n=81)
Group C--Regular students with no learning problems (n=53)
Group D--Students with Learning Problems (n=6)

T-tests: LASSI averages and GPAs between Experimental and Control Groups

Variable	$\bar{X}$ Mean in (Percentile)	S.D.	t value	p value
Total LASSI Average (Affective and Cognitive)				
Group A:	27.38 (57.31)	2.83		
Group B:	26.10 (50.27)	2.87	2.83	.005*
Grade Point Averages for regular students (no learning problems)				
FALL				
Group A:	2.67	.74		
Group B:	2.47	.72	1.70	.090
SPRING				
Group A:	2.69	.72		
Group B:	2.47	.62	1.60	.110
Grade Point Averages for experimental group (ASL videotape)				
FALL				
Group C:	2.67			
Group D:	2.03		2.28	.025*
SPRING				
Group A:	2.69			
Group B:	1.89		2.51	.015*

* Significant differences below the $p<.05$ level.

Appendix C: Table of LASSI raw scores (with percentile ranks in parenthesis) for SPS deaf students with learning problems:

T-tests: LASSI averages and GPAs between Experimental and Control Groups

Variable	$\bar{X}$	Mean in (Percentile)	S.D.	t value	p value
Affective					
Group A: (Experimental with ASL videotape, n=8):		(49.75)			
Group B: (Control without the videotape, n=8):		(46.50)			
ATT- Group A:		(25.75)			
Group B:		(25.62)			
MOT- Group A:		(60.00)			
Group B:		(46.88)			
TMT- Group A:		(58.75)			
Group B:		(68.12)			
ANX- Group A:		(38.75)			
Group B:		(37.50)			
CON- Group A:		(65.50)			
Group B:		(54.38)			
Cognitive					
Group A:	(59.54)				
Group B:	(73.21)				
INP- Group A:		(57.50)			
Group B:		(73.00)			
SMI- Group A:		(28.87)			
Group B:		(48.75)*			
STA- Group A:		(69.38)			
Group B:		(78.75)			
SFT- Group A:		(68.75)			
Group B:		(85.50)			
TST- Group A:		(23.50)			
Group B:		(25.63)			
AVG- Group A:		(49.68)			
Group B:		(54.41)			

* Significant differences below the $p<.05$ level.

Appendix D: Table of Pearson Correlation Coefficients for LASSI Scores with Grade Point Averages for Experimental and Control Groups and Regular Students.

Group A: Experimental group using the LASSI with videotape (n=90)
Group B: Control group taking the LASSI without videotape (n=104)
Group C: Regular students with no learning problems

Variables LASSI subscales	Fall GPA	Spring GPA	Aug DRP	Dec DRP	May DRP	Aug EPR	Dec EPR	May EPR
ATT-Group A:	.01*							
Group B:	.21							
Group C:	.44	.30			.33			
MOT-Group A:	.19*							
Group B:	.35**							
Group C:	.34	.30	.35	.46		.31	.43	
TMT-Group A:	.26**							
Group B:	.30**							
Group C:	.38	.34						.33
ANX-Group A:	.10							
Group B:	.11							
Group C:								.32
CON-Group A:	.11							
Group B:	.15							
Group C:	.41	.46						.41
INP-Group A:	.14							
Group B:	.23*							
Group C:	.64**	.37	.48*	.58*				
SMI-Group A:	.11							
Group B:	.13							
Group C:			.41	.40	.31	.36		
STA-Group A:	.19*							
Group B:	.21*							
Group C:	.36	.31						
SFT-Group A:	.28*							
Group B:	.31**							
Group C:	.53*							
TST-Group A:	.01							
Group B:	.07							
AVG-Group A:	.26*							
Group B:	.36**							
Group C:	.53*	.39						

1-tailed significance: *=p<.01 **=p<.001

Appendix E: Interaction Effects of DRP, Learning Problems, and Video on GPAs and LASSI Scores (ANOVA)

Variables	F value	Significance of F
GPA average		
Main	5.992	.000*
Aug DRP levels	1.586	.185
Lprob	21.880	.000*
Video	.751	.388
Fall GPA		
Main	5.263	.000*
Aug DRP levels	2.478	.048*
Lprob	15.929	.000*
Video	.751	.388
Spring GPA		
Main	4.032	.001*
Aug DRP levels	1.225	.305
Lprob	14.339	.000*
Video	1.795	.184
LASSI average		
Main	2.873	.012*
Aug DRP levels	3.411	.012*
Lprob	.008	.931
Video	4.022	.047*

Appendix F: Prediction of GPAs for Regular Students

Variables	B (Slope)	Multiple R	Variance
Fall GPA			
LASSI Avg	.39	.47	.22
Aug DRP levels	.02		
Attitude (LASSI)	.33		
Time management	.02		
Self-testing	.03		
Spring GPA			
LASSI Avg		.33	.11
May DRP levels			
Attitude (LASSI)			
Time Management			
Self-testing			
Spring GPA for 10 New Students			
LASSI Avg	.06	.91	.82
May DRP	.07		
Attitude (LASSI)	.68		
Time Management	.06		
Self-testing	.05		

F value=4.50
Significance of F=.087